

Beck (J. B.)

THE NEW YORK JOURNAL OF MEDICINE.

FOR SEPTEMBER, 1846.

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On the Effects of Emetics in the young subject. By JOHN B. BECK, M.D., Professor of Materia Medica and Medical Jurisprudence in the College of Physicians and Surgeons of New York.

WITH the exception of cathartics, there is no class of remedies more generally resorted to in the management of the diseases of children, than emetics; and in a large number of cases, there is certainly none more useful. They are active agents, however, and like all agents of this description are capable of doing good or evil, according to the manner in which they are given. In the use of them, therefore, it is all important to ascertain whether there is anything in the young subject which modifies their operation. Unless this is done, it is impossible, of course, to prescribe them with any degree of precision, or even safety. The subject is one of interest as well as of practical importance, although it does not appear to have attracted the attention to which it is so justly entitled. In a previous paper,* I endeavored to point out how the effects of opium were modified in the infant subject. On the present occasion, I propose to pursue a similar investigation in relation to Emetics.

As it regards *the mere mechanical act of vomiting, young children perform it more easily than adults.* This is a fact which has long been observed by practical men, and about which there can be no question. It is no doubt a wise provision of the Creator to enable the child to relieve itself from the effects of an overloaded stomach, to which it is so constantly liable in the early period of its existence. Although the fact has thus been long known, and the intention of it is obvious, yet the reasons have not been so well understood. They appear to be the two following.

In the first place, from the experiments of Majendie, in relation to the manner in which vomiting is performed, it would seem that in that pro-

* Journal of Medicine and the Collateral Sciences, for January, 1844, p. 1.

cess, the stomach is in a great measure passive, and that a certain degree of pressure upon it from the surrounding organs is absolutely necessary, before vomiting can be accomplished. This pressure is made by the contraction of the diaphragm from above and of the abdominal muscles from below, upon the viscera surrounding the stomach. As a matter of course, the pressure thus exerted will be greater or less, according to the volume of the viscera. Now it is well known that in the early periods of life, the abdominal viscera have a much larger proportional size than they have in the adult. This is particularly the case with the liver.* In early life, therefore, during the act of vomiting, the pressure made upon the stomach by the surrounding organs must necessarily be greater than it is in the adult, and in consequence of this, the greater the ease with which the organ is evacuated.

In the second place, the shape of the stomach in the infant is more favorable to the easy evacuation of its contents. That the stomach undergoes successive changes in its shape, from birth onwards, is a fact, which although but recently investigated, is, I believe, well established, and for its elucidation we are indebted to the labors of Prof. Shultz of Germany. His attention seems to have been called to it from the peculiarities which he noticed in the shape of the stomach of those animals which vomit easily, and those which cannot be made to vomit at all. Thus for example, the horse, rabbit, hare, and guinea pig, cannot be made to vomit even by the most powerful emetics, while the dog and the cat throw up very readily—and he found that the shape of the stomach in the two sets of animals was entirely different, and that the same difference exists between the stomach of the child and the stomach of the adult. The former is more of a conical form, drawn out lengthwise, and gradually narrowing towards the two extremities. The œsophagus is inserted into the fundus at the left extremity, and at a distance from the pylorus, leaving the two curvatures of the stomach running almost parallel to each other. In short the stomach of the child resembles that of the carnivorous animals generally. The latter, i. e. the stomach of the adult, is very different; it is more circular in its form, and the œsophagus, instead of being inserted into the left extremity, is in the middle, between the left extremity and the pylorus. The pylorus, too, is drawn back towards the cardia, so that the small curvature is very short, while the large curvature is greatly extended. The consequence of all this is, that the stomach of the adult has a rounder shape, resembling that of herbivorous animals generally. Now, according to Prof. Shultz, the stomach which approaches nearest to the cylindrical shape, must have its contents evacuated with the greatest ease;† and this would appear to be the case, as a matter of course, whatever theory of vomiting may be adopted; whether performed, as some suppose, by the simple antiperistaltic action of the stomach itself; or according to Majendie, by the contractions of the diaphragm and abdominal muscles alone; or according to others, by the combined action of all these organs.

The foregoing considerations would seem to account very satisfactorily, both physiologically and anatomically, for the fact with which we

* According to Meckel the proportion between the weight of the liver and that of the whole body, is as 1 : 18 or as 1 : 20, in the full grown fœtus; while in the adult it is as 1 : 35 or as 1 : 36. Meckel's Anatomy by Doane, vol. iii., p. 309.

† British and Foreign Medical Review, vol. ii., p. 537.

started, that the mechanical act of vomiting is performed with greater ease in the child than in the adult. If vomiting, then, be induced in a child by mild agents, the whole process is performed with greater facility than by the adult. This, then, is the *first* peculiarity in the effects of Emetics in children.

If, on the other hand, *Emetics of an active and debilitating character, and which produce much nausea, be used, the effects are more uncertain and energetic than in the adult.* The articles to which I allude, are the antimonial emetics, and these accordingly are frequently hazardous to young children, and that, too, when used in doses not peculiarly large. The immortal Sydenham seems to have been fully aware of this fact. In speaking of the continued fever of 1661, 2, 3, and 4, he says, "it has often been a difficulty with me, when called to infants and children in a fever, and observing an emetic indicated, whereby they might have been preserved from danger, that I durst not give them this infusion (*crocus metallorum*), for fear of a bad consequence."* It will be recollected, that at this time the *Ipecacuanha* had not yet been discovered. Dr. Clarke of London states that "a quarter of a grain of Tartrate of Antimony in solution, has been known to excite a vomiting which has ended in the death of a young child, which before was in no danger."† Dr. Armstrong observes that he "has seen again and again, delirium produced by antimonial preparations, given so as to excite the mucous membrane of the stomach and intestinal canal in very young children."‡ Dr. Hamilton advises, that "Tartar Emetic should never be given to infants, for alarming convulsions have followed its use."§ By Mr. Noble of Manchester, a case is related, in which the death of a child, eleven months old, was owing to the effect of antimonial wine given as an emetic.|| Mr. Wilton (surgeon to the Gloucester Infirmary) has also reported two cases of children, one a year old and the other four years old, which were manifestly destroyed by the use of antimonial wine given for ordinary colds. Slight convulsions—vomiting—diarrhœa—sudden prostration and death took place, notwithstanding the use of cordials and stimulants.¶ I have known a case occurring in this city in which the one thirtieth part of a grain of Tartar Emetic given to a child a year old, laboring under croup, produced such severe and protracted vomiting, together with general prostration, as to require stimulants to save life. Some years since I was called to see a child, about three years old, who had been attacked with scarlet fever. The symptoms at first were mild, and no danger was apprehended in the case, when it was suddenly taken with such alarming symptoms of prostration as to call for a consultation. On inquiry, I found that the attending physician had been prescribing small doses of Tartar Emetic. Notwithstanding the use of stimulants, the child died in an hour or two after I saw it. I then suspected, and have since been confirmed in the correctness of the suspicion, that the medicine had no little agency in bringing about

* The Works of Thomas Sydenham, M.D., with notes by Benj. Rush, M.D., p. 18.

† Commentaries on some of the most important Diseases of Children. By JOHN CLARKE, M.D., &c., p. 33.

‡ Lectures by the late JOHN ARMSTRONG, M.D., p. 248.

§ A Treatise on the management of Female Complaints, and of Children in early infancy. By ALEX. HAMILTON, M.D., p. 353.

|| Provincial Medical and Surgical Journal. By Robert J. N. Streeten, M.D., 1844, p. 47.

¶ Ibid, p. 204.

the fatal result. The child was naturally delicate, and there certainly was nothing in the symptoms of the case to account for such a termination.

The foregoing facts would seem sufficient to show the *uncertainty* as well as *energy* with which Tartar Emetic operates on the young subject, and the causes are obvious.

In the first place, Tartar Emetic is a powerful sedative, and it is well known, that in early life, the system cannot bear so well the operation of this class of agents, as it can in the adult. A striking illustration of this we have in blood-letting, when carried to the extent of producing syncope. Adults, as a general rule, recover very readily from this state; children, on the contrary, recover very slowly, and there is always more or less danger to life either from convulsions or general prostration, and the same thing holds good in relation to Tartar Emetic. Besides this, Tartar Emetic frequently acts as a local irritant. From the delicacy of the mucous tissue in early life, it is of course more apt to act as such at that period, than it is in advanced years. In both these ways, it is evident that Tartar Emetic must necessarily prove more energetic in its action on the young subject.

In the second place, there is scarcely any medicine, whose action is more decidedly modified by the existing condition of the system than Tartar Emetic. In the ordinary state of the system, it acts as a sedative to the circulation, but at the same time causes, even in very moderate doses, nausea, vomiting, sometimes free purging and diaphoresis. On the other hand, in certain states of the system characterized by high inflammatory action, very large doses and frequently repeated too, may be given without any other effect than that of lessening excitement, and curing the disease. Again, as soon as this state of excitement is subdued under the use of the remedy, all the ordinary physiological effects of it are reproduced. Under these circumstances the article can no longer be tolerated, and the use of it must be relinquished. All these interesting peculiarities are abundantly illustrated in the treatment of pneumonia, as first practised by Rasori in Italy, then by Laennec in France, and afterwards by numerous English and American physicians. Now, if Tartar Emetic is thus modified in the adult by the existing state of the system, how much more readily must all this take place in the young subject. In the successive changes taking place in the child in the different states of disease, from irritation to inflammation, it is hardly possible to estimate the degree of uncertainty attending the operation of this article.

Again, vomiting, we know, depends very much upon the existing condition of the nervous system. In certain conditions of the brain and nerves, it takes place very readily, while in others it is almost impossible to excite it, even by the most powerful means. For example, when the system is under the influence of some narcotic, such as opium, everybody is aware how difficult it is to bring on vomiting; and the same thing occurs in the other morbid states of the nervous system, such as apoplexy, &c. Notwithstanding this, it has been observed, that if under these circumstances, large quantities of Tartar Emetic be given, or if the use of it be too often repeated, although vomiting may not be induced, yet there may remain sensibility enough in the system to enable it to operate as a poison. An interesting case illustrative of this is related by Cloquet, of a person laboring under apoplexy, who received

into his stomach upwards of forty grains of Tartar Emetic, without producing either nausea or vomiting. On dissection, besides the morbid state of the brain, extensive lesions were found in the alimentary canal, which were attributed to the action of the Tartar Emetic retained in the stomach.* Dr. Christison quotes a case from the *Edinburgh Medical and Surgical Journal* (vol. vii., p. 305), in which a scruple of Tartar Emetic was given to a person poisoned by opium, without producing any effect as an emetic; sulphate of zinc was afterwards given and with success. As he recovered from the effects of the opium, he was seized with pains in the stomach and bowels, and with tenesmus, which lasted several days.† Now, it must be evident that in the young subject, all these results are much more likely to occur, than in the adult.

While Tartar Emetic operates in this way on the young subject, Ipecacuanha is never known to be followed by any injurious consequences. To the youngest infant it may be given not only with impunity, but frequently with the greatest benefit. Why this is so, must be manifest, if we reflect for a moment upon the peculiar properties of the two articles. Although both are emetics, yet they differ widely from each other in many important respects. The one is a mild article and limited in its operation to the stomach, upon which it never produces anything like local irritation, even when given in large doses. The other, besides acting as a powerful emetic, is a direct sedative, capable of producing general prostration, and in some cases acting as a local irritant to the stomach and bowels, showing itself in excessive vomiting and diarrhœa.

With regard to the manner in which Tartar Emetic proves so dangerous to infants, it is probably more by its action as a sedative, than as a local irritant. This may be inferred from the symptoms attending those cases, as well as from the appearances on dissection.‡ In the two cases recorded by Mr. Wilton already alluded to, the main symptoms were those of collapse, and on dissection no appearances of inflammation could be detected either in the stomach or intestinal canal. In the case, however, related by Mr. Noble, on dissection, evidences of local inflammation were found in the mucous membrane of the ileum.‡

The foregoing, then, appear to be the important peculiarities in the effects of Emetics on the young subject. While vomiting, induced by ipecacuanha and other mild means, is performed with greater ease than by the adult and does not injuriously affect the system, the vomiting induced by Tartar Emetic is frequently followed by severe symptoms, and sometimes proves fatal.

Now the due understanding of these peculiarities is evidently of the highest importance in the use of Emetics in children, and upon the mind of the student and young practitioner especially, they cannot be too deeply impressed. From the manner in which medicines are treated of in classes, in most of the books of *Materia Medica*, and in the lectures on that subject, the student is insensibly led into the belief of a greater resemblance between them than really exists in nature, and it is only after he has had some experience of his own, that the error is corrected.

* Paris and Fonblanque, *Medical Jurisprudence*, vol. ii., p. 280.

† *Elements of Medical Jurisprudence*. By T. R. Beck, M.D., and J. B. Beck, M.D., vol. ii., p. 586.

‡ *Provincial Journal* for 1844, p. 48.

He cannot, therefore, too early in his career, learn that all classifications are artificial—not founded in nature—that medicines are arranged in classes, merely for the sake of convenience, not because the articles under each class are precisely alike, but because they resemble each other in some one or more important feature, while in other respects they differ greatly. No two medicines, even in the same class, are precisely similar, and in acquiring a knowledge of them, the study of the points of difference is even more important than those in which they resemble each other.

From the foregoing considerations, it appears to me that some inferences of practical value, to the young practitioner at least, may be deduced.

1. As a general rule we need not be afraid of vomiting the youngest child, provided the means used be mild—such as ipecacuanha, &c. The mere act of vomiting is attended with no danger, while the remedial agency of an emetic is one of great power and value. Besides acting on the stomach, it extends its influence to the mucuous membrane lining the pulmonary organs, promoting secretion in the first place, and then aiding in dislodging and ejecting morbid accumulations; accordingly, in pulmonary affections, there is nothing so efficacious.

2. The vomiting induced by the preparations of antimony ought to be resorted to with great caution in very young children, and should never be used except in those cases where a sedative effect is required, and can be borne with safety. Inflammatory excitement ought then always to be present to justify its use in a young child. Where the object is simply to evacuate the stomach, it ought never to be thought of. In such cases as croup and pneumonic inflammation, it may be justifiably and beneficially used. In those cases it will be found, that the system can bear the sedative influence of the article much better than it can in the ordinary conditions of the system. Even here, however, care should be taken not to push the article too far, as dangerous collapse has been known sometimes to be the result.

3. The *continued use* of Tartar Emetic in young subjects cannot be too specially guarded against. It is in this way, probably, that it is so apt to prove injurious. A single dose, even though it vomits very freely, may be borne with comparative impunity, while the repetition of it may keep up nausea and intestinal irritation, so as to cause injurious prostration. This is very likely to happen in cases of a chronic character, like whooping-cough. Although mild emetics are among our best remedies in this disease, and where the subject is old enough, a single emetic of antimony is frequently exceedingly beneficial, yet the repeated use of antimonial emetics, as is too often the case, appears to me to be a great error in practice. It is not indicated by the nature of the symptoms, and violates a great rule which ought always to be observed in the management of chronic cases, and that is, not to break down unnecessarily the strength of the patient.* Again, in ordinary catarrhal affections in children, a good deal of mischief is frequently done by the continued use of expectorant mixtures containing this active article. The Hive Syrup of Dr. Coxe, which is now in every family, and is

* Dr. Armstrong says that "it is a most notorious fact, that the whooping-cough is far more fatal in London than in the country; and I believe," he adds, "that this arises from the very free use of antimonials in London." Lectures, p. 248.

given on the slightest occasions to infants, without even consulting a physician, has, I am convinced, done a great deal of harm. I say this without wishing to undervalue this preparation. In proper cases it is really a useful article, but persons out of the profession ought to know that its principal efficacy is owing to the quantity of Tartar Emetic which it contains, and that the indiscriminate use of it in cases where mild articles are required, must be injurious.*

4. As the effect of Tartar Emetic on the system cannot always be measured by its emetic operation, even in the adult, this fact ought to serve as a caution against the too common practice of giving repeated doses of it to produce vomiting in children, when they happen to be narcotized. While it fails to vomit, it may still operate as a poison to the system. In all cases of this kind, the proper method of treatment is, not to push the emetic, but to endeavor to restore the sensibility of the patient, and then sometimes vomiting comes on at once.

5. In using Tartar Emetic in children, especial regard should be had to their constitutions. In those naturally delicate, and especially where the scrofulous diathesis exists, it should never be used if it can be avoided. Prostration is much more apt to ensue in them, and where the article is persisted in for any length of time, is sure to do harm. It is in such constitutions, when laboring under hooping-cough, and where the use of this article has been too long continued, that the baneful effects of it are most strikingly observed.

6. It is perhaps hardly necessary to say that if Tartar Emetic be an article of such danger, the younger the subject to whom it is given, the more likely is it to do harm. In children under a year, I should say, as a general rule, it ought never to be used. During that period, the powers of life are too feeble to bear so active a remedy, at the same time that all the beneficial effects of an emetic may be gained from the use of ipecacuanha, or even milder means.

* Every ounce of Coxe's Hive Syrup contains one grain of Tartar Emetic. My friend, Dr. McCready, has communicated to me the particulars of a case in which a child between four and five years of age, laboring under hooping-cough, manifestly sunk under the too frequent use of this article. The exhibition of it had been continued about eight days, when symptoms of intestinal irritation came on, accompanied with great general prostration, which in a few days ended the child's existence.